Claims

We claim the following:

1. A multi-fluid atomizing nozzle comprising:

a nozzle body of defined shape having a first and second end, the nozzle body having a nozzle body chamber located proximal to the second end of the nozzle body, the nozzle body having an outer surface, the nozzle body having a nosepiece of defined size and shape incorporated into the nozzle body, the nosepiece having a first and second end, the nosepiece being located at the second end of the nozzle body, the nosepiece protruding out from the nozzle body, the nosepiece having a nosepiece chamber with a first and second end, the nozzle body chamber flowing into the nosepiece chamber, the second end of the nosepiece having an aperture allowing fluid communication between the inside of the nosepiece chamber and the exterior of the nozzle body;

a nozzle cap having a first and second end, the nozzle cap having a shape complimentary to the defined shape of second end of the nozzle body, the nozzle cap further having an inner and outer surface, the first end of the nozzle cap being open, the second end of the nozzle cap being closed with the exception of a nozzle cap aperture of defined diameter;

a means for mating the nozzle cap with the second end of the nozzle body;

a mixing chamber formed by the mating of the second end of the nozzle body and the first end of the nozzle cap, when mated together there being a specified distance between the second end of the nozzle body and the inner surface of the second end of the nozzle cap;

a means for supplying and directing a stream of dispersion gas to the mixing chamber;

a means for supplying and directing a stream of feed stock to the nozzle body chamber;

a means for supplying and directing a stream of atomizing fluid to the nozzle body chamber.

2. A multi-fluid atomizing nozzle as described in claim 1, wherein the feed stock means and atomizing fluid means are oriented in a way to achieve a mixing of the two streams during normal operation.

3. A multi-fluid atomizing nozzle as described in claim 1, wherein the feed stock and atomizing fluid streams are angled towards the center of the first end of the nosepiece chamber.

4. A multi-fluid atomizing nozzle as described in claim 1 wherein, the feed stock and atomizing streams are angled towards the center of the nosepiece chamber at an angle between 0-60° off center.

5. A multi-fluid atomizing nozzle as described in claim 1 wherein, the feed stock and atomizing streams are angled towards the center of the nosepiece chamber at an angle of approximately 30° off center.

6. A multi-fluid atomizing nozzle as described in a claim 1 wherein, the nosepiece aperture and nozzle cap aperture are axially aligned.

7. A multi-fluid atomizing nozzle as described in claim 1, wherein the means for supplying a stream of feed stock is a feed stock tube having a first and second end, the feed stock tube having a defined diameter, the feed stock tube being attached to and partially housed within the nozzle body, the first end of the feed stock extending out from the first end of the nozzle body, the second end of the feed stock tube terminating in the nozzle body's chamber, wherein the first end of the feed stock tube being connected to a feed stock supply.

8. A multi-fluid atomizing nozzle as described in claim 1, wherein the means for supplying a stream of atomizing fluid is an atomizing fluid tube having a first and second end, the first end of the atomizing fluid tube having a defined diameter, the second end of the atomizing fluid tube having a narrower diameter than the first end, the atomizing fluid tube being attached to and partially housed within the nozzle body, the first end of the atomizing fluid tube extending out from first end of the nozzle body, the second end of the atomizing fluid tube terminating in the nozzle body's chamber, wherein the first end of the atomizing fluid tube is connected to a supply of atomizing fluid.

9. A multi-fluid atomizing nozzle as described in claim 1, wherein the dispersion gas means is a dispersion gas tube having a first and second end, the dispersion gas tube having a defined diameter, the dispersion gas tube running lengthwise through the nozzle body, the first end of the feed stock

extending out from the nozzle body, the dispersion gas tube being attached to and housed within the nozzle body, wherein the dispersion gas tube is connected to a supply of dispersion gas.

10. A multi-fluid atomizing nozzle as described in claim 1, wherein the feed stock is a hydrocarbon.

11. A multi-fluid atomizing nozzle as described in claim 1, wherein the feed stock is a viscous fluid.

12. A multi-fluid atomizing nozzle as described in claim 1, wherein the dispersion gas is an oxidant.

13. A multi-fluid atomizing nozzle as described in claim 1, wherein the dispersion gas is air.

14. A multi-fluid atomizing nozzle as described in claim 1, wherein the atomizing fluid is water.

15. A multi-fluid atomizing nozzle as described in claim 1, wherein the defined shape of the nozzle body is cylindrical.

16. A multi-fluid atomizing nozzle as described in claim 1 wherein, the defined shape of the nosepiece is cylindrical.

17. A multi-fluid atomizing nozzle as described in claim 1 wherein, the distance between the second end of the nozzle body and second end of the nozzle cap is between 0.175"-0.375".

18. A multi-fluid atomizing nozzle as described in claim 1 wherein, the distance between the second end of the nozzle body and second end of the nozzle cap is preferably between 0.225"-0.275".

19. A multi-fluid atomizing nozzle as described in claim 1 wherein, the length of the nosepiece is approximately 0.125"

20. A multi-fluid atomizing nozzle as described in claim 1, wherein the length of the nosepiece is between 0.075" and 0.175".

21. A multi-fluid atomizing nozzle as described in claim 1 wherein the diameter of the nosepiece aperture is between 0.010-0.250".

22. A multi-fluid atomizing nozzle as described in claim 1 wherein the diameter of the cap aperture is between 0.05-1"

23. A multi-fluid atomizing nozzle as described in claim 9 wherein the diameter of the dispersion gas tube is between 0.20"-0.75".

24. A multi-fluid atomizing nozzle as described in claim 8 wherein the diameter of the first end of the atomizing tube is between 0.10"-0.50".

25. A multi-fluid atomizing nozzle as described in claim 8 wherein the diameter of the second end of the atomizing tube is between 0.010"-0.10".

26. A multi-fluid atomizing nozzle as described in claim 7 wherein the diameter of the first end of the feed stock tube is between 0.08"-0.160"

27. A multi-fluid atomizing nozzle as described in claim 7 wherein the diameter of the second end of the feed stock tube is between 0.005"-0.030".

28. A method of atomizing fluids comprising:

teeming a stream of feed stock liquid into a first chamber the chamber having at least one high pressure atomization jet, when available a stream of atomizing fluid emanating from the atomizing jet(s);

orienting the feed stock and atomization streams in way to achieve a mixing of the two streams, during normal operating conditions the mixing

creating a stream of atomizing fluid-feed stock fluid mixed spray;

directing the stream of atomizing-feed stock mixed spray into a second chamber;

radially inserting a dispersion gas into the second chamber, forming a well mixed atomizing fluid-feed stock fluid-dispersion gas mixture;

directing the atomizing fluid-feed stock-dispersion gas mixture to a desired location.

29. A method of atomizing fluids as described in claim 28 wherein,

the feed stock forms a film of feed stock between the first and second chambers when the high pressure atomization fluid is unavailable;

the dispersion gas radially contacting the feed stock film atomizing the feed stock into atomized feed stock-dispersion gas spray;

directing the atomized feedstock-dispersion air spray to a desired location.

30. A method of atomizing fluids in claim 28 wherein, the feed stock stream is atomized by the atomization stream during normal operational conditions.

31. A method of atomizing fluids in claim 28 wherein, the atomizing fluid is water, and where in the water is pumped at low pressure into the first chamber.

32. The method described in claim 28 wherein, the pressure of the atomization fluid is between 5-200 psi, during normal operating conditions.

33. The method described in claim 28 wherein, the pressure of the atomization fluid is preferably between 10-60psi, during normal operating conditions.

34. The method described in claim 28 wherein, the pressure of the dispersion gas is approximately 1 psi.

35. The method described in claim 28 wherein, the pressure of the feed stock is between 0.5-100 psi.

36. The method described in claim 28 wherein, the flow rate of the dispersion gas is between 15-300 slpm.

37. The method described in claim 28 wherein, the flow rate of the feed stock is between 2-50cc/min.

38. The method described in claim 28 wherein, the flow rate of the liquid equivalent of the atomizing fluid is between 0-100cc/min.

39. The method described in claim 28 wherein, the feed stock is a heavy hydrocarbon.

40. The method described in claim 28 wherein, the feed stock is viscous fluid.

41. The method described in claim 28 wherein, the feed stock is diesel.

42. The method described in claim 28 wherein, the atomizing fluid is water, particularly in the form of steam.

43. The method described in claim 28 wherein, the dispersion gas is an oxidant.

44. The method described in claim 28 wherein, the dispersion gas is air.

45. The method described in claim 28 wherein, the dispersion gas is O_2.

46. A multi-fluid atomizing nozzle comprising:

a nozzle body of defined shape having a first and second end, the second end of the nozzle body having a chamber located proximal to the second end of the nozzle body, the nozzle body having an outer surface, the nozzle body having a nosepiece of defined size and shape located at the

second end of the nozzle body, the nosepiece protruding out from the nozzle body, the nosepiece also having a chamber, the nozzle body's central chamber flowing into the nosepiece chamber, the nosepiece having an aperture allowing fluid communication between the inside of the nosepiece chamber and the exterior of the nozzle body, the nozzle body further having a atomizing fluid channel, feed stock channel and a dispersion gas channel.

the dispersion gas channel having a defined diameter, the dispersion channel having a first and second end, the dispersion gas channel running the length of the nozzle body;

the feed stock channel having a first and second end, the feed stock channel beginning at the first end of the nozzle body and terminating in the nozzle body's chamber, the feed stock channel having a defined diameter, the second end of the feed stock channel having a specified orientation;

the atomizing fluid channel having a first and second end, the feed stock channel beginning at the first end of the nozzle body and terminating in the nozzle body's chamber, the first end of the atomizing fluid channel having a defined diameter, the second end of the atomizing fluid channel having a narrower diameter than the first end, the second end of the atomizing fluid channel having a specified orientation, wherein the atomizing fluid and feed stock channels are oriented in a way to achieve mixing of their two streams;

a nozzle cap having a first and second end, the nozzle cap having a cup-like shape complimentary to the defined shape of second end of the nozzle body, the nozzle cap further having an inner and outer surface,

wherein the inner surface of the first end of the nozzle cap engages and attaches to the outer surface of the second end of the nozzle body, the second end of the nozzle cap being closed with the exception of an aperture of defined diameter;

a mixing chamber formed by the mating of second end of the nozzle body and the first end of the nozzle cap, there being a specified distance between the nosepiece and the inner surface of the second end of the nozzle cap, there also being a specified distance between the second end of the nozzle body and the inner surface of the second end of the nozzle cap.